

WHAT IS CLAIMED IS:

1 1. A delay equalizer connected between input and output terminals,
2 comprising:

3 a resonance circuit including an inductor and a capacitor and
4 having a resonance frequency for determining a center frequency for
5 delay equalization; and

6 a variable resistor made variable in resistance,

7 with a Q value of said resonance circuit being varied by a change
8 of a resistance of said variable resistor to vary a quantity of the delay
9 equalization.

1 2. A delay equalizer connected between input and output terminals,
2 comprising:

3 a resonance circuit including an inductor and a variable
4 capacitance capacitor made variable in capacitance and having a
5 resonance frequency for determining a center frequency for delay
6 equalization; and

7 a variable resistor made variable in resistance,

8 with said center frequency for the delay equalization being made
9 variable with a variation of the capacitance of said variable capacitance
10 capacitor, and a Q value of said resonance circuit being varied with a
11 variation of resistance of said variable resistor to vary a quantity of the
12 delay equalization.

1 3. A delay equalizer according to claim 1, wherein a PIN diode is
2 used as said variable resistor, and a power circuit is additionally

3 provided to control a current flowing through said PIN diode, with the
4 current flowing through said PIN diode being controlled to change an
5 internal resistance of said PIN diode for controlling the quantity of
6 the delay equalization.

1 4. A delay equalizer according to claim 2, wherein a voltage
2 variable capacitor whose capacitance is made variable through voltage
3 control is used as said variable capacitor, and a power circuit is
4 additionally provided to control a voltage across said voltage
5 variable-capacitance capacitor, with the voltage across said voltage
6 variable capacitor being controlled to vary the resonance frequency of
7 said resonance circuit for controlling the center frequency for the delay
8 equalization.

1 5. A delay equalizer according to claim 2, wherein an PIN diode
2 is used as said variable resistor, and a first power circuit is
3 additionally provided to control a current flowing through said PIN
4 diode, a voltage variable capacitor whose capacitance is made
5 variable under voltage control is used as said variable capacitor, and
6 a second power circuit is further provided to control a voltage across
7 said voltage variable capacitor, with the current flowing said PIN
8 diode being controlled by said first power circuit to vary an internal
9 resistance of said PIN diode for controlling the quantity of the delay
10 equalization, and the voltage across said voltage variable capacitor
11 being controlled by said second power circuit to vary the resonance

12 frequency of said resonance circuit for controlling the center
13 frequency for the delay equalization.

1 6. A delay equalizer comprising a plurality of delay equalizing
2 sections each including an inductor, a capacitor and a variable
3 resistor, cascade-connected between input and output terminals, with
4 a resistance of said variable resistor of each of said delay equalizing
5 sections being individually controlled to vary a quantity of delay
6 equalization according to center frequency of each delay equalizing
7 section.

1 7. A delay equalizer comprising a plurality of delay equalizing
2 sections each including an inductor, a variable capacitor and a
3 variable resistor, cascade-connected between input and output
4 terminals, with a capacitance of said variable capacitor of each of
5 said delay equalizing sections being individually controlled to vary a
6 resonance frequency of a resonance circuit comprising said inductor
7 and said variable capacitor for controlling a center frequency for
8 delay equalization in each of said delay equalizing sections, and a
9 resistance of said variable resistor of each of said delay equalizing
10 sections being individually controlled to vary a quantity of the delay
11 equalization according to center frequency of each delay equalizing
12 section.

1 8. A delay equalizer according to claim 6, wherein, in each of said
2 delay equalizing sections, a PIN diode is used as said variable

3 resistor, and a power circuit is additionally provided to control a
4 current flowing through said PIN diode, with the current flowing
5 through said PIN diode of each of said delay equalizing sections
6 being controlled to change an internal resistance of said PIN diode
7 for controlling a quantity of delay equalization.

1 9. A delay equalizer according to claim 7, wherein, in each of said
2 delay equalizing sections, a voltage variable capacitor whose
3 capacitance is made variable in accordance through voltage control
4 is used as said variable capacitor, and a power circuit is additionally
5 provided for controlling a voltage across said voltage variable
6 capacitor, with the voltage across said voltage variable capacitor of
7 each of said delay equalizing sections being controlled to vary the
8 resonance frequency of said resonance circuit so that the center
9 frequency is varied according to delay equalizing section.

1 10. A delay equalizer according to claim 7, wherein, in each of said
2 delay equalizing sections, a PIN diode is used as said variable
3 resistor, and a first power circuit is additionally provided for
4 controlling a current passing through said PIN diode, while a voltage
5 variable capacitor whose capacitance is made variable through
6 voltage control is used as said variable capacitor, and a second
7 power circuit is further provided for controlling a voltage across said
8 voltage variable capacitor, with the current flowing through said PIN
9 diode of each of said delay equalizing sections being controlled by
10 said first power circuit to vary an internal resistance of said PIN

11 diode for controlling the quantity of the delay equalization according
12 to delay equalizing section, and the voltage across said voltage
13 variable capacitor of each of said delay equalizing sections being
14 controlled by said second power circuit to vary the resonance
15 frequency of said resonance circuit for controlling the center
16 frequency according to delay equalizing section.

1 11. An optical transmitter comprising:
2 frequency modulating means for frequency-modulating
3 frequency-multiplexed multi-channel signals;
4 optical modulating means for intensity-modulating signal light
5 on the basis of the modulated signals obtained by said frequency
6 modulating means for optical transmission; and
7 a delay equalizer provided before said optical modulating
8 means and including an inductor and a capacitor, which constitute a
9 resonance circuit with a resonance frequency for determining a
10 center frequency for delay equalization, and a variable resistor made
11 variable in resistance, with a Q value of said resonance circuit being
12 varied by varying a resistance of said variable resistor for controlling
13 a quantity of delay equalization so that a delay deviation on a
14 frequency-modulated signal transmission line being equalized by
15 said delay equalizer to reduce a delay distortion stemming from the
16 delay deviation.

1 12. An optical transmitter comprising:

2 frequency modulating means for frequency-modulating
3 frequency-multiplexed multi-channel signals;
4 optical modulating means for intensity-modulating signal light
5 on the basis of the modulated signals obtained by said frequency
6 modulating means for optical transmission; and
7 a delay equalizer provided before said optical modulating
8 means and including an inductor and a variable capacitor made
9 variable in capacitance, which constitute a resonance circuit with a
10 given resonance frequency which determines a center frequency for
11 delay equalization, and a variable resistor made variable in
12 resistance, with the center frequency for the delay equalization being
13 varied by varying a capacitance of said variable capacitor and a Q
14 value of said resonance circuit being varied by varying a resistance
15 of said variable resistor for controlling a quantity of the delay
16 equalization so that a delay deviation on a frequency-modulated
17 signal transmission line is equalized by said delay equalizer to
18 reduce a delay distortion stemming from the delay deviation.

1 13. An optical transmitter comprising:
2 frequency modulating means for frequency-modulating
3 frequency-multiplexed multi-channel signals; optical modulating
4 means for intensity-modulating signal light on the basis of the
5 modulated signals obtained by said frequency modulating means for
6 optical transmission; and

7 a delay equalizer provided before said optical modulating
8 means and including an inductor and a capacitor, which constitute a
9 resonance circuit with a resonance frequency determining a center
10 frequency for delay equalization, a PIN diode made variable in
11 resistance, and a power circuit for controlling a current flowing
12 through said PIN diode, with a current flowing through said PIN diode
13 being controlled to vary an internal resistance of said PIN diode for
14 controlling a quantity of the delay equalization so that a delay
15 deviation on a frequency-modulated signal transmission line is
16 equalized by said delay equalizer to reduce a delay distortion
17 stemming from the delay deviation.

1 14. An optical transmitter comprising:
2 frequency modulating means for frequency-modulating
3 frequency-multiplexed multi-channel signals;
4 optical modulating means for intensity-modulating signal light
5 with the modulated signals obtained by said frequency modulating
6 means for optical transmission; and
7 a delay equalizer provided before said optical modulating
8 means and including an inductor and a voltage variable capacitor
9 made variable in capacitance through voltage control, which
10 constitute a resonance circuit with a resonance frequency
11 determining a center frequency for delay equalization, a variable
12 resistor made variable in resistance, and a power circuit for
13 controlling a voltage across said voltage variable capacitor, with a Q

14 value of said resonance circuit being varied by varying a resistance
15 of said variable resistor for controlling a quantity of the delay
16 equalization, and the voltage across said voltage variable capacitor
17 being controlled to vary said resonance frequency of said resonance
18 circuit for controlling the center frequency for the delay equalization
19 so that a delay deviation on a frequency-modulated signal
20 transmission line is equalized by said delay equalizer to reduce a
21 delay distortion stemming from the delay deviation.

1 15. An optical transmitter comprising:
2 frequency modulating means for frequency-modulating
3 frequency-multiplexed multi-channel signals;
4 optical modulating means for intensity-modulating signal light
5 on the basis of the modulated signals obtained by said frequency
6 modulating means for optical transmission; and
7 a delay equalizer provided before said optical modulating
8 means and including an inductor and a voltage variable capacitor
9 made variable in capacitance through voltage control, which
10 constitute a resonance circuit with a resonance frequency
11 determining a center frequency for delay equalization, a PIN diode
12 made variable in resistance, a first power circuit for controlling a
13 current flowing through said PIN diode, and a second power circuit
14 for controlling a voltage across said voltage variable capacitor, with
15 the current flowing through said PIN diode being controlled by said
16 first power circuit to vary an internal resistance of said PIN diode for

17 controlling a quantity of the delay equalization, and the voltage
18 across said voltage variable capacitor being controlled by said
19 second power circuit to vary the resonance frequency of said
20 resonance circuit for controlling the central frequency for the delay
21 equalization so that a delay deviation on a frequency-modulated
22 signal transmission line is equalized by said delay equalizer to
23 reduce a delay distortion stemming from the delay deviation.

1 16. An optical transmitter comprising:
2 frequency modulating means for frequency-modulating
3 frequency-multiplexed multi-channel signals;
4 optical modulating means for intensity-modulating signal light
5 on the basis of the modulated signals obtained by said frequency
6 modulating means for optical transmission; and
7 a delay equalizer provided before said optical modulating
8 means and including a plurality of delay equalizing sections, each
9 including an inductor, a capacitor and a variable resistor,
10 cascade-connected between input and output terminals, with a
11 quantity of delay equalization being varied according to center
12 frequency of each delay equalizing section by individually controlling
13 a resistance of said variable resistor of each of the delay equalizing
14 sections so that a delay deviation on a frequency-modulated signal
15 transmission line is equalized by said delay equalizer to reduce a
16 delay distortion stemming from the delay deviation.

1 17. An optical transmitter comprising:

frequency modulating means for frequency-modulating
frequency-multiplexed multi-channel signals;

optical modulating means for intensity-modulating signal light
on the basis of the modulated signals obtained by said frequency
modulating means for optical transmission; and

a delay equalizer provided before said optical modulating
means and including a plurality of delay equalizing sections, each
including an inductor, a variable capacitor and a variable resistor,
cascade-connected between input and output terminals, with a
resonance frequency of a resonance circuit being varied by
individually controlling a capacitance of said variable capacitor of
each of said delay equalizing sections for controlling a center
frequency for delay equalization, and a quantity of delay equalization
being varied according to center frequency by individually controlling
a resistance of said variable resistor of each of said delay equalizing
sections so that a delay deviation on a frequency-modulated signal
transmission line is equalized by said delay equalizer to reduce a
delay distortion stemming from the delay deviation.

18. An optical transmitter according to claim 16, wherein, in each
of the delay equalizing sections, a PIN diode is used as said variable
resistor, and a power circuit is additionally provided for controlling a
current flowing through said PIN diode, with the current flowing
through said PIN diode of each of said delay equalizing sections

6 being controlled to vary an internal resistance of said PIN diode for
7 controlling a quantity of the delay equalization.

1 19. An optical transmitter according to claim 17, wherein, in each
2 of the delay equalizing sections, a voltage variable capacitor made
3 variable in capacitance through voltage control is used as said
4 variable capacitor, and a power circuit is additionally for controlling a
5 voltage across said voltage variable capacitor, with the voltage value
6 across said voltage variable capacitor of each of said delay
7 equalizing sections being controlled to vary the resonance frequency
8 of said resonance circuit for controlling a center frequency for each
9 of said delay equalizing sections.

1 20. An optical transmitter according to claim 17, wherein, in each
2 of the delay equalizing sections, a PIN diode is used as the variable
3 resistor, and a first power circuit is additionally provided for
4 controlling a current flowing through said PIN diode, while a voltage
5 variable capacitor made variable in capacitance through voltage
6 control is used as said variable capacitor, and a second power circuit
7 is further provided for controlling a voltage across said voltage
8 variable capacitor, with the current flowing through said PIN diode of
9 each of said delay equalizing sections being controlled by said first
10 power circuit to vary an internal resistance of said PIN diode for
11 controlling a quantity of the delay equalization according to delay
12 equalizing section, and the voltage across said voltage variable
13 capacitor each of said delay equalizing sections being controlled by

14 said second power circuit to vary the resonance frequency of said
15 resonance circuit for controlling the center frequency according to
16 delay equalizing section.

1 21. An optical transmission system comprising:
2 an optical transmitter including:
3 frequency modulating means for frequency-modulating
4 frequency-multiplexed multi-channel signals;
5 optical modulating means for intensity-modulating signal
6 light on the basis of the modulated signals obtained by said
7 frequency modulating means for optical transmission; and
8 a delay equalizer provided before the optical modulating
9 means and is composed of a resonance circuit comprising an
10 inductor and a capacitor and having a resonance frequency for
11 determining a center frequency for delay equalization, and a variable
12 resistor made variable in resistance, with a Q value of said
13 resonance circuit being varied in accordance with a variation of a
14 resistance of said variable resistor for controlling a quantity of the
15 delay equalization; and
16 an optical receiver for optical/electrical-converting and
17 frequency-demodulating an optical signal transmitted from said
18 optical transmitter to transmit frequency-multiplexed multi-channel
19 signals,
20 said delay equalizer equalizing a delay deviation on a
21 frequency-modulated signal transmission line in said optical

22 transmitter and further equalizing a delay deviation on a
23 frequency-modulated signal transmission line in said optical receiver
24 to reduce a delay distortion stemming from the delay deviations from
25 said optical transmitter to said optical receiver.

1 22. An optical transmission system comprising:
2 an optical transmitter including;
3 frequency modulating means for frequency-modulating
4 frequency-multiplexed multi-channel signals;
5 optical modulating means for intensity-modulating signal
6 light on the basis of the modulated signals obtained by said
7 frequency modulating means for optical transmission; and
8 a delay equalizer provided before said optical modulating
9 means and composed of a resonance circuit comprising an inductor
10 and a variable capacitor made variable in capacitance and having a
11 resonance frequency determining a center frequency for delay
12 equalization, and a variable resistor made variable in resistance, with
13 the center frequency for the delay equalization being varied in
14 accordance with a variation of a capacitance of said variable
15 capacitor, and a Q value of said resonance circuit being varied in
16 accordance with a variation of a resistance of said variable resistor
17 for controlling a quantity of the delay equalization; and
18 an optical receiver for optical/electrical-converting and
19 frequency-demodulating an optical signal transmitted from said

20 optical transmitter to transmit frequency-multiplexed multi-channel
21 signals,

22 said delay equalizer equalizing a delay deviation on a
23 frequency-modulated signal transmission line in said optical
24 transmitter and further equalizing a delay deviation on a
25 frequency-modulated signal transmission line in said optical receiver
26 to reduce a delay distortion stemming from the delay deviations from
27 said optical transmitter to said optical receiver.

1 23. An optical transmission system comprising:

2 an optical transmitter including;

3 frequency modulating means for frequency-modulating
4 frequency-multiplexed multi-channel signals;

5 optical modulating means for intensity-modulating signal
6 light on the basis of the modulated signals obtained by said
7 frequency modulating means for optical transmission; and

8 a delay equalizer provided before said optical modulating
9 means and composed of a resonance circuit comprising an inductor
10 and a capacitor and having a resonance frequency for determining a
11 center frequency for delay equalization, a PIN diode made variable in
12 resistance, and a power circuit for controlling a current passing
13 through said PIN diode, with a current flowing through said PIN diode
14 being controlled to vary an internal resistance of said PIN diode for
15 controlling a quantity of delay equalization; and

16 an optical receiver for optical/electrical-converting and
17 frequency-demodulating an optical signal transmitted from said
18 optical transmitter to transmit frequency-multiplexed multi-channel
19 signals,

20 said delay equalizer equalizing a delay deviation on a
21 frequency-modulated signal transmission line in said optical
22 transmitter and further equalizing a delay deviation on a
23 frequency-modulated signal transmission line in said optical receiver
24 to reduce a delay distortion stemming from the delay deviations from
25 said optical transmitter to said optical receiver.

1 24. An optical transmission system comprising:

2 an optical transmitter including;

3 frequency modulating means for frequency-modulating
4 frequency-multiplexed multi-channel signals;

5 optical modulating means for intensity-modulating signal
6 light on the basis of the modulated signals obtained by said
7 frequency modulating means for optical transmission; and

8 a delay equalizer provided before said optical modulating
9 means and composed of a resonance circuit comprising an inductor
10 and a voltage variable capacitor made variable in capacitance
11 through voltage control and having a resonance frequency for
12 determining a center frequency for delay equalization, a variable
13 resistor made variable in resistance, and a power circuit for
14 controlling a voltage across said voltage variable capacitor, with a Q

15 value of said resonance circuit being varied in accordance with a
16 variation of the resistance of said variable resistor for controlling a
17 quantity of the delay equalization, and the voltage across said
18 voltage variable capacitor being controlled to vary the resonance
19 frequency of said resonance circuit for controlling the center
20 frequency for the delay equalization; and

21 an optical receiver for optical/electrical-converting and
22 frequency-demodulating an optical signal transmitted from said
23 optical transmitter to transmit frequency-multiplexed multi-channel
24 signals,

25 said delay equalizer equalizing a delay deviation on a
26 frequency-modulated signal transmission line in said optical
27 transmitter and further equalizing a delay deviation on a
28 frequency-modulated signal transmission line in said optical receiver
29 to reduce a delay distortion stemming from the delay deviations from
30 said optical transmitter to said optical receiver.

1 25. An optical transmission system comprising:

2 an optical transmitter including;

3 frequency modulating means for frequency-modulating
4 frequency-multiplexed multi-channel signals;

5 optical modulating means for intensity-modulating signal
6 light on the basis of the modulated signals obtained by said
7 frequency modulating means for optical transmission; and

8 a delay equalizer provided before said optical modulating
9 means and composed of a resonance circuit comprising an inductor
10 and a voltage variable capacitor made variable in capacitance
11 through voltage control and having a resonance frequency for
12 determining a center frequency for delay equalization, a PIN diode
13 made variable in resistance, a first power circuit for controlling a
14 current flowing through said PIN diode, and a second power circuit
15 for controlling a voltage across said voltage variable capacitor, with
16 the current flowing through said PIN diode being controlled by said
17 first power circuit to vary an internal resistance of said PIN diode for
18 controlling a quantity of the delay equalization, and the voltage
19 across said voltage variable capacitor being controlled by said
20 second power circuit to vary the resonance frequency of said
21 resonance circuit for controlling the center frequency for the delay
22 equalization; and

23 an optical receiver for optical/electrical-converting and
24 frequency-demodulating an optical signal transmitted from said
25 optical transmitter to transmit frequency-multiplexed multi-channel
26 signals,

27 said delay equalizer equalizing a delay deviation on a
28 frequency-modulated signal transmission line in said optical
29 transmitter and further equalizing a delay deviation on a
30 frequency-modulated signal transmission line in said optical receiver
31 to reduce a delay distortion stemming from the delay deviations from
32 said optical transmitter to said optical receiver.

- 1 26. An optical transmission system comprising:
2 an optical transmitter including;
3 frequency modulating means for frequency-modulating
4 frequency-multiplexed multi-channel signals;
5 optical modulating means for intensity-modulating signal
6 light on the basis of the modulated signals obtained by said
7 frequency modulating means for optical transmission; and
8 a delay equalizer provided before said optical modulating
9 means and composed of a plurality of delay equalizing sections,
10 each including an inductor, a capacitor and a variable resistor,
11 cascade-connected between input and output terminals, with a
12 resistance of said variable resistor of each of said delay equalizing
13 sections being controlled individually for controlling a quantity of
14 delay equalization according to center frequency of each of said
15 delay equalizing sections; and
16 an optical receiver for optical/electrical-converting and
17 frequency-demodulating an optical signal transmitted from said
18 optical transmitter to transmit frequency-multiplexed multi-channel
19 signals,
20 said delay equalizer equalizing a delay deviation on a
21 frequency-modulated signal transmission line in said optical
22 transmitter and further equalizing a delay deviation on a
23 frequency-modulated signal transmission line in said optical receiver

24 to reduce a delay distortion stemming from the delay deviations from
25 said optical transmitter to said optical receiver.

1 27. An optical transmission system comprising:
2 an optical transmitter including;
3 frequency modulating means for frequency-modulating
4 frequency-multiplexed multi-channel signals;
5 optical modulating means for intensity-modulating signal
6 light on the basis of the modulated signals obtained by said
7 frequency modulating means for optical transmission; and
8 a delay equalizer provided before said optical modulating
9 means and composed of a plurality of delay equalizing sections,
10 each including an inductor, a variable capacitor and a variable
11 resistor, cascade-connected between input and output terminals, with
12 a capacitance of said variable capacitor of each of said delay
13 equalizing sections being control individually to vary a resonance
14 frequency of a resonance circuit comprising said inductor and said
15 variable capacitor for controlling a center frequency for delay
16 equalization, and a resistance of said variable resistor of each of
17 said delay equalizing sections being controlled individually for
18 controlling a quantity of the delay equalization according to center
19 frequency of each of said delay equalizing sections; and
20 an optical receiver for optical/electrical-converting and
21 frequency-demodulating an optical signal transmitted from said

22 optical transmitter to transmit frequency-multiplexed multi-channel
23 signals,
24 said delay equalizer equalizing a delay deviation on a
25 frequency-modulated signal transmission line in said optical
26 transmitter and further equalizing a delay deviation on a
27 frequency-modulated signal transmission line in said optical receiver
28 to reduce a delay distortion stemming from the delay deviations from
29 said optical transmitter to said optical receiver.

1 28. An optical transmission system according to claim 26, wherein,
2 in each of said delay equalizing sections, a PIN diode is used as said
3 variable resistor, and a power circuit is additionally provided for
4 controlling a current value flowing through said PIN diode, with the
5 current flowing through said PIN diode of each of said delay
6 equalizing sections being controlled to vary an internal resistance of
7 said PIN diode for controlling the quantity of the delay equalization.

1 29. An optical transmission system according to claim 27, wherein,
2 in each of said delay equalizing sections, a voltage variable
3 capacitor made variable in capacitance through voltage control is
4 used as said variable capacitor, and a power circuit is additionally
5 provided for controlling a voltage across said voltage variable
6 capacitor, with the voltage value across said voltage variable
7 capacitor of each of said delay equalizing sections being controlled
8 to vary the resonance frequency of said resonance circuit for
9 controlling the center frequency at every delay equalizing section.

1 30. An optical transmission system according to claim 27, wherein,
2 in each of said delay equalizing sections, a PIN diode is used as said
3 variable resistor, and a first power circuit is additionally provided for
4 controlling a current flowing through said PIN diode, while a voltage
5 variable capacitor made variable in capacitance through voltage
6 control is used as said variable capacitor, and a second power circuit
7 is further provided for controlling a voltage across said voltage
8 variable capacitor, with the current flowing said PIN diode of each of
9 said delay equalizing sections being controlled by said first power
10 circuit to vary an internal resistance of said PIN diode for controlling
11 the quantity of the delay equalization at every delay equalizing
12 section, and a voltage across said voltage variable capacitor of each
13 of said delay equalizing sections being controlled by said second
14 power circuit to vary the resonance frequency of said resonance
15 circuit for controlling the center frequency at every delay equalizing
16 section.